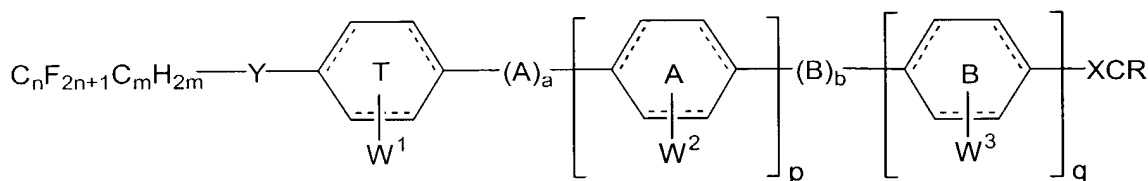


# CLAIMS

We claim:

1. A chiral, non-racemic liquid crystal composition which comprises an achiral liquid crystal host and up to about 100% by weight of one or more chiral, non-racemic compounds having the formula:



wherein n and m are integers ranging from 1 to about 20;

a, b, p and q are either 0 or 1, when p is 0, a is 0 and when q is 0, b is 0;

Y is a single bond or an oxygen;

X is selected from the group consisting of a single bond, oxygen, -CO-, -O-CO-, and -CO-O-;

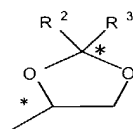
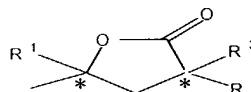
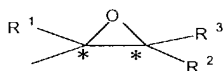
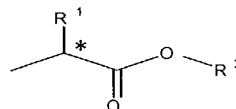
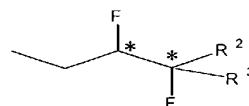
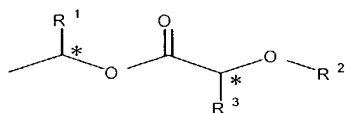
CR is a chiral, non-racemic tail group except that CR cannot be a chiral hydrocarbon tail;

A and B, independently, are linker groups that can be selected from the group consisting of -CO-, -O-CO-, -CO-O-, -CH<sub>2</sub>-CH<sub>2</sub>-, -CH<sub>2</sub>-CH<sub>2</sub>-O-, -O-CH<sub>2</sub>-CH<sub>2</sub>-, -C≡C-, -C=C-, and -C=C-C=C-;

W<sup>1</sup>, W<sup>2</sup>, and W<sup>3</sup>, independently, represent one or more optional substituents on core rings which can be selected from the group consisting of H, halide, alkyl, haloalkyl, alkenyl, haloalkenyl, nitro and nitrile; and

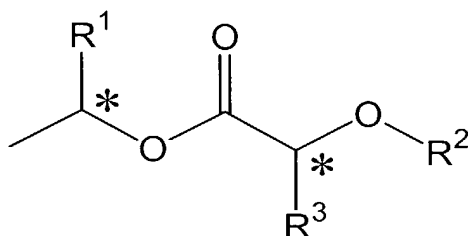
rings T, A and B together representing the mesogenic core are selected from the group cyclohexane, cyclohexene, a phenyl and a naphthyl group wherein one or two ring CH<sub>2</sub> groups or CH groups are replaced by -N-, NH-, -O- or -CO-.

2. The composition of claim 1 wherein CR is selected from the group consisting of :

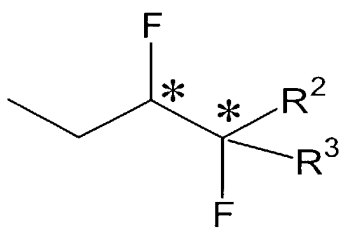


wherein \* indicates an asymmetric carbon; R<sup>1</sup> and R<sup>3</sup>, independently of each other, are lower alkyl or alkenyl groups optionally substituted with one or more halogens, and R<sup>2</sup> is an alkyl, alkenyl, ether, thioether, or silyl group having from 1 to about 20 carbon atoms wherein one or more CH<sub>2</sub> groups are replaced with -S-, -O-, -CO-, -CO-O-, -O-CO-, or -Si(R')<sub>2</sub>, and where R' is a lower alkyl optionally substituted with one or more halogens.

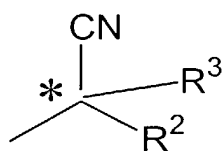
3. The composition of claim 1 wherein CR is:



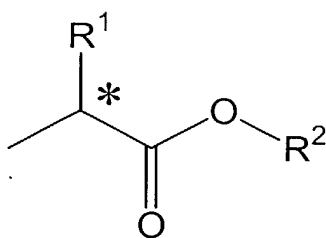
4. The composition of claim 1 wherein CR is:



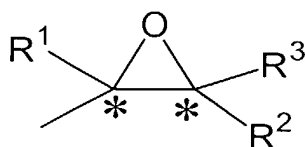
5. The composition of claim 1 wherein CR is:



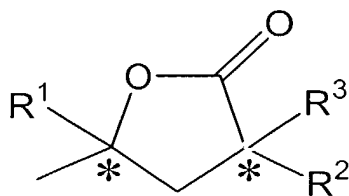
6. The composition of claim 1 wherein CR is:



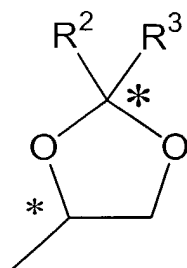
7. The composition of claim 1 wherein CR is:



8. The composition of claim 1 wherein CR is:

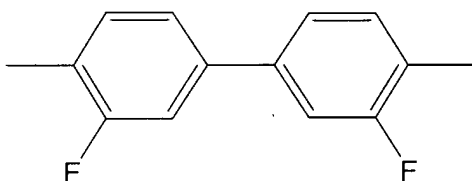


9. The composition of claim 1 wherein CR is:

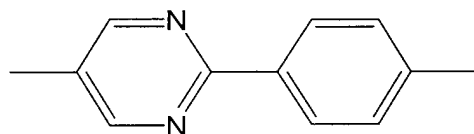


10. The composition of claim 1 wherein the chiral nonracemic compound has a biphenyl mesogenic core.

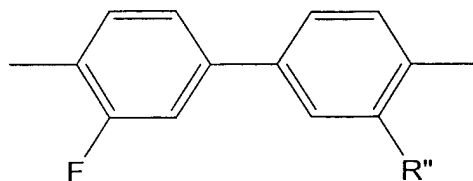
11. The composition of claim 1 wherein the chiral nonracemic compound has the mesogenic core:



12. The composition of claim 1 wherein the chiral nonracemic compound has the mesogenic core:



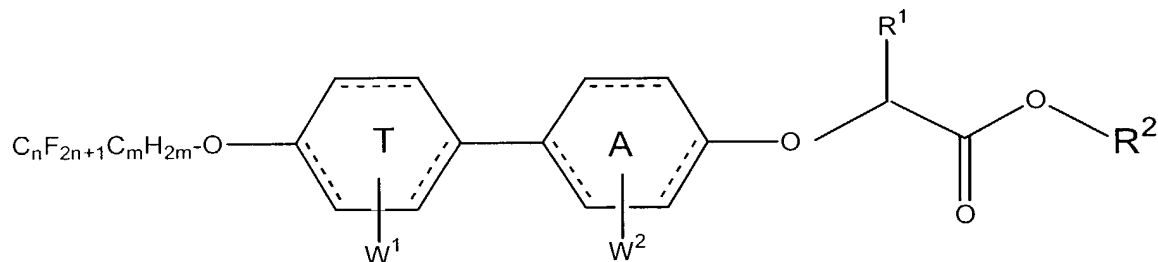
13. The composition of claim 1 wherein the chiral nonracemic compound has the mesogenic core:



where R'' is a lower alkyl group.

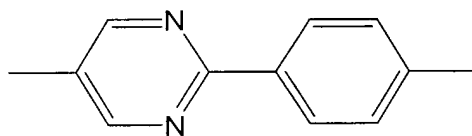


23. The composition of claim 1 which has Ps of 10 nC/cm<sup>2</sup> or more at room temperature.
24. The composition of claim 23 wherein the chiral nonracemic compounds are present at a level of 5% by weight or less.
25. A chiral nonracemic compound having the formula:



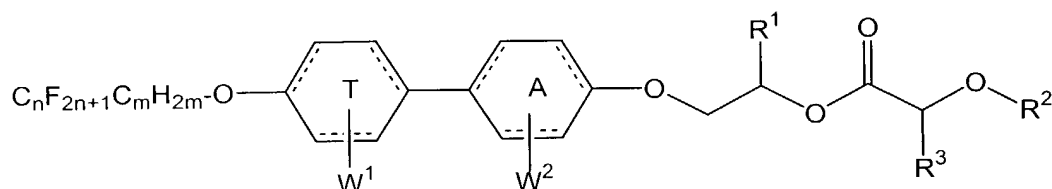
where n and m are integers ranging from 1 to about 15, W<sup>1</sup> and W<sup>2</sup>, independently, represent one or more optional substituents on mesogenic core rings which can be selected from the group consisting of H, halide, alkyl, haloalkyl, alkenyl, haloalkenyl, and nitrile; rings T and A together representing the mesogenic core are selected from the group cyclohexane, cyclohexene, a phenyl and a naphthyl group wherein one or two ring CH<sub>2</sub> groups or CH groups are replaced by -N-, NH-, -O- or -CO-; R<sup>1</sup> is a lower alkyl or alkenyl group optionally substituted with one or more halogens and R<sup>2</sup> is an alkyl, alkenyl, ether, thioether, or silyl group having from 1 to about 20 carbon atoms wherein one or more CH<sub>2</sub> groups are replaced with -S-, -O-, -CO-, -CO-O-, -O-CO-, or -Si(R')<sub>2</sub>, and where R' is a lower alkyl optionally substituted with one or more halogens.

26. The compound of claim 25 wherein n = m.
27. The compound of claim 25 wherein R<sup>1</sup> is a methyl group.
28. The compound of claim 25 wherein the mesogenic core is:



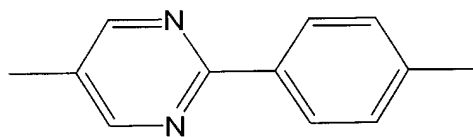
29. The compound of claim 25 wherein the mesogenic core is biphenyl.

30. A chiral nonracemic compound having the formula:

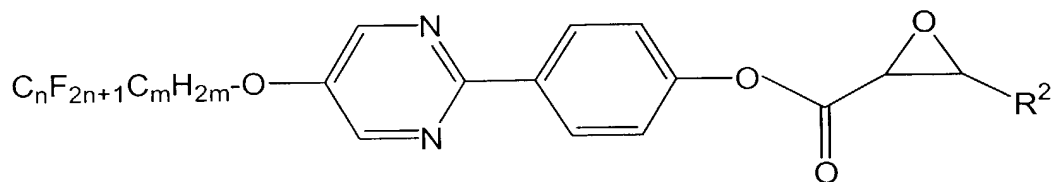


where n and m are integers ranging from 1 to about 15,  $W^1$  and  $W^2$ , independently, represent one or more optional substituents on mesogenic core rings which can be selected from the group consisting of H, halide, alkyl, haloalkyl, alkenyl, haloalkenyl, and nitrile; rings T and A together representing the mesogenic core are selected from the group cyclohexane, cyclohexene, a phenyl and a naphthyl group wherein one or two ring  $CH_2$  groups or CH groups are replaced by -N-, NH, -O- or -CO-;  $R^1$  and  $R^3$  are lower alkyl or alkenyl groups that are optionally substituted with one or more halogens and  $R^2$  is an alkyl, alkenyl, ether, thioether, or silyl group having from 1 to about 20 carbon atoms wherein one or more  $CH_2$  groups are replaced with -S-, -O-, -CO-, -CO-O-, -O-CO-, or -Si( $R'$ )<sub>2</sub>, and where  $R'$  is a lower alkyl optionally substituted with one or more halogens.

31. The compound of claim 30 wherein  $n = m$ .
32. The compound of claim 30 wherein  $R^1$  and  $R^3$  are both methyl groups.
33. The chiral nonracemic compound of claim 30 wherein the mesogenic core is biphenyl.
34. The chiral nonracemic compound of claim 33 wherein the mesogenic core is:



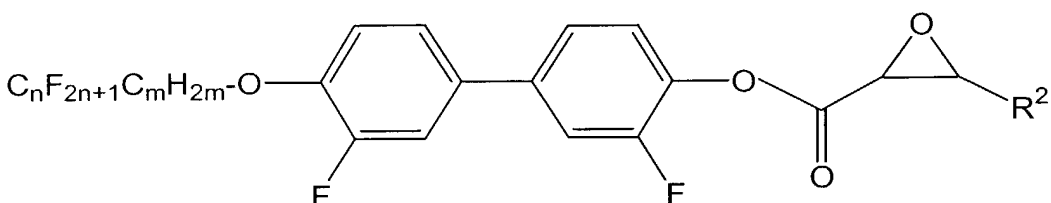
35. A chiral nonracemic compound having the formula:



where n and m are integers ranging from 1 to about 15 and  $R^2$  is an alkyl, alkenyl, ether, thioether, or silyl group having from 1 to about 20 carbon atoms wherein one or more  $CH_2$  groups are replaced with -S-, -O-, -CO-, -CO-O-, -O-CO-, or -Si( $R'$ )<sub>2</sub>, and where  $R'$  is a lower alkyl optionally substituted with one or more halogens.

37. The compound of claim 36 wherein  $n = m$ .

38. A chiral nonracemic compound having the formula:



where n and m are integers ranging from 1 to about 15 and  $R^2$  is an alkyl, alkenyl, ether, thioether, or silyl group having from 1 to about 20 carbon atoms wherein one or more  $CH_2$  groups are replaced with -S-, -O-, -CO-, -CO-O-, -O-CO-, or -Si( $R'$ )<sub>2</sub>, and where  $R'$  is a lower alkyl optionally substituted with one or more halogens.

39. The compound of claim 38 wherein  $n = m$ .

40. An optical device comprising one or more compounds of claim 1.